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A Preliminary Application of Conditional Nonlinear Optimal Perturbation to Rainfall of Typhoon Fung-wong (2008)

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Using the WRF model (Weather Research & Forecast Model system) Version 3.2 and its adjoint form, the conditional nonlinear optimal perturbation (CNOP) method is presented to study the sensitivity area of the rainfall of typhoon Fung-wong from 29 to 31 July, 2008 in Jiangsu province China. By defining the objective function of the dry energy norm, the CNOP is calculated and the structure of the CNOP is given. According to the location of the optimal perturbation, the effects of initial errors are investigated. It is indicated that the location of the initial errors of CNOP roughly match the heavy rainfall areas. The relationship between the initial errors development and the effects of atmospheric circulation background, moisture source and cold air intrusion on the rainfall of Typhoon Fung-wong is analyzed respectively. The results suggest that the CNOP is a powerful tool for studying predictability and sensitivity of rainfall of typhoon.

Keywords: rainfall, typhoon Fung-wong, Conditional Nonlinear Optimal Perturbation (CNOP), WRF model